Claims

1. A method for the heat treatment of solids containing iron oxide, in which fine-grained solids are heated to a temperature of 700 to 1150°C in a fluidized bed reactor (8) , **characterized in that** a first gas or gas mixture is introduced from below into a mixing chamber region (15) of the reactor (8) through at least one gas supply tube (9), the gas supply tube (9) being at least partly surrounded by a stationary annular fluidized bed (12) which is fluidized by supplying fluidizing gas, and that the gas velocities of the first gas or gas mixture and of the fluidizing gas for the annular fluidized bed (12) are adjusted such that the Particle-Froude-Numbers in the gas supply tube (9) are between 1 and 100, in the annular fluidized bed (12) between 0.02 and 2, and in the mixing chamber (15) between 0.3 and 30.

2. The method as claimed in claim 1, **characterized in that** the Particle-Froude-Number in the gas supply tube (9) lies between 1.15 and 20.

3. The method as claimed in claim 1 or 2, **characterized in that** the Particle-Froude-Number in the annular fluidized bed (12) lies between 0.115 and 1.15.

4. The method as claimed in any of the preceding claims, **characterized in that** the Particle-Froude-Number in the mixing chamber (15) lies between 0.37 and 3.7.

5. The method as claimed in any of the preceding claims, **characterized in that** the filling level of solids in the reactor (8) is adjusted such that the annular fluidized bed (12) extends beyond the upper orifice end of the gas supply tube (9), so that solids are constantly introduced into the first gas or gas mixture and are entrained by the gas stream to the mixing chamber (15) located above the orifice region of the gas supply tube (9).

6. The method as claimed in any of the preceding claims, **characterized in that** iron ore, nickel ore containing iron oxide, manganese ore containing iron oxide or chromium ore containing iron oxide is used as starting material.

7. The method as claimed in any of the preceding claims, **characterized in that** fuel is supplied to the reactor (8), through whose combustion with an oxygen-containing gas at least part of the amount of heat required for the thermal treatment is generated.

8. The method as claimed in claim 7, **characterized in that** the fuel is introduced into the reactor (8) through the gas supply tube (9).

9. The method as claimed in claim 7 or 8, **characterized in that** the fuel is introduced into the annular fluidized bed (12) and/or the mixing chamber (15) of the reactor (8).

10. The method as claimed in any of claims 7 to 9, **characterized in that** oxygen-containing gas with an oxygen content of 15 to 30 % is introduced into the reactor (8) either through a conduit above the annular fluidized bed or through the central tube (9).

11. The method as claimed in any of the preceding claims, **characterized in that** at least part of the exhaust gas of a second reactor (14, 14') downstream of the reactor (8) is introduced into the reactor (8) via the gas supply tube (9).

12. The method as claimed in claim 11, **characterized in that** a mixture of exhaust gas from the second reactor (14, 14'), of an oxygen-containing gas and of gaseous fuel is supplied to the reactor (8) through the gas supply tube (9).

13. The method as claimed in any of the preceding claims, **characterized in that** a hot gas is supplied to the reactor (8) via the gas supply tube (9), which was generated in a combustion chamber (29) upstream of said reactor by the combustion of gaseous fuel and/or fuel-containing exhaust gas from a further reactor (14, 14', 30) downstream of the reactor (8).

14. The method as claimed in any of the preceding claims, **characterized in that** air is supplied to the reactor (8) as fluidizing gas for the annular fluidized bed (12).

15. The method as claimed in any of the preceding claims, **characterized in that** the pressure in the reactor (8) is between 0,8 and 10 bar.

16. The method as claimed in any of the preceding claims, **characterized in that** before entering the reactor (8) the solids are preheated in at least one preheating stage consisting of a suspension heat exchanger (5) and a downstream cyclone (6).

17. The method as claimed in claim 16, **characterized in that** the solids in the first suspension heat exchanger (2) are heated by exhaust gas from the second suspension heat exchanger (5) and in the second suspension heat exchanger (5) by exhaust gas from the reactor (8).

18. The method as claimed in claim 16 or 17, **characterized in that** 0 to 100 % of the solids separated in a cyclone (3) of the first preheating stage are directly introduced into the reactor (8) via a bypass conduit (28) bypassing the second preheating stage, whereas the remaining amount is first introduced into the second preheating stage, before the same is also introduced into the reactor (8).

19. A plant for the heat treatment of solids containing iron oxide, in particular for performing a method as claimed in any of claims 1 to 18, comprising a reactor (8) constituting a fluidized bed reactor, **characterized in that** the reactor (8) has a gas supply system which is formed such that gas flowing through the gas supply system entrains solids from a stationary annular fluidized bed (12), which at least partly surrounds the gas supply system, into the mixing chamber (15).

20. The plant as claimed in claim 19, **characterized in that** the gas supply system has at least one gas supply tube (9) extending upwards substantially vertically from the lower region of the reactor (8) into the mixing chamber (15) of the reactor (8), the gas supply tube (9) being at least partly surrounded by a chamber in which the stationary annular fluidized bed (12) is formed.

21. The plant as claimed in claim 20, **characterized in that** the gas supply tube (9) is arranged approximately centrally with reference to the cross-sectional area of the reactor (8).

22. The plant as claimed in any of claims 19 to 21, **characterized in that** the gas supply tube (9) has openings, for instance in the form of slots, at its shell surface.

23. The plant as claimed in any of claims 19 to 22, **characterized in that** a cyclone (17) for separating solids is provided downstream of the reactor (8), and that the cyclone (17) has a solids conduit (18) leading to the annular fluidized bed (12) of the reactor (8).

24. The plant as claimed in any of claims 19 to 23, **characterized in that** in the annular chamber of the reactor (8) a gas distributor (11) is provided, which divides the chamber into an upper fluidized bed region (12) and a lower gas distributor chamber (10), and that the gas distributor chamber (10) is connected with a supply conduit for fluidizing gas.

25. The plant as claimed in any of claims 19 to 24, **characterized in that** the reactor (8) has a fuel supply conduit (21, 20) leading to the gas supply tube (9) and/or a fuel supply conduit (21, 20) leading to the annular chamber.

26. The plant as claimed in any of claims 19 to 25, **characterized in that** the reactor (8) has a supply conduit for oxygen-containing gas, which leads to the gas supply tube (9) or into a region above the annular fluidized bed (12).

27. The plant as claimed in any of claims 19 to 26, **characterized in that** upstream of the reactor (8) a combustion chamber (29) is provided.

28. The plant as claimed in any of claims 19 to 27, **characterized in that** the gas supply tube (9) of the reactor (8) is connected with another reactor (14, 14', 30) downstream of the reactor (8) via a supply conduit (20).